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INSTRUCTIONS

FOR

GRAZING SURVEYS

ON

NATIONAL FORESTS

1935

Approved:

January 9, 1935.

Acting Forester.

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INSTRUCTIONS FOR GRAZING SURVEYS

ON NATIONAL FORESTS

F O R E W O R D

The purpose of these instructions is to outline the present policy of the Forest Service for the conduct of grazing surveys, and to standardize the methods used in the various Regions to the extent necessary to obtain the desired accuracy and uniformity in results. Conditions vary in the different Regions so that it is impractical to lay down absolutely standardized methods. It may be necessary for each Regional Forester to issue supplementary written instructions to his field officers, based upon the principles herein outlined, regarding methods not standardized by these instructions. Copies of such supplemental instructions should be sent to the Forester for review.

The need for adequate plans for grazing management on all Forests is so great and special survey funds are so limited that rangers and other administrative men will find these instructions useful in conducting such surveys of their resources as are decided upon in accordance with these instructions.

Since 1910, when grazing surveys were initiated, and including the year 1933, over 53,000,000 acres have been covered by special crews or special men and 9,000,000 acres by local administrative officers. Approximately 82,500,000 acres of Government land within the National Forests are producing forage used by domestic livestock. In addition about 5,000,000 acres closed to domestic stock, are available to game animals. Altogether about 25,000,000 acres of importance either for domestic or game animals remain to be covered by range surveys.

O B J E C T

There is a growing need for the fullest use and conservation of the range and related resources for such purposes as watershed protection, livestock production, game conservation and recreation. The closest integration and correlation of these uses are essential if serious conflicts are to be avoided. As the demands for the various uses increase conflicts develop, the settlement of which requires accurate information regarding all the factors involved. It is for the purpose of obtaining these basic facts, analyzing the various problems and from them developing a comprehensive plan for managing the various uses of the resources, that grazing surveys are conducted. A completed plan of grazing management should show what the grazing resources are, their physical condition, their relation to other resources, and how they may be best utilized, developed, and improved.

(Over)

The collection of field data and the preparation of management plans, while essential, are of no greater importance than the training of the men who take part in the work. This activity is essentially field laboratory work in range management. It involves every phase of invoicing range resources, studying and analyzing problems, working out solutions, and providing for the application of thorough-going plans. In view of the recognized need for thoroughly trained range technicians and administrators, the importance of training in the conduct of survey projects should be stimulated in every way and adequately provided for.

R E S P O N S I B I L I T Y

Forester

The function of the Washington office will be to correlate and standardize, preferably by field contact, the methods and practices of grazing surveys, to unify the development of management plans, and to make allotment of funds for the work.

Plans for all projects involving the expenditure of funds from the special grazing survey schedule during the following fiscal year will be submitted to the Forester for approval by February 15 of each year. These plans should specify the intensity with which the field work is to be conducted. If a change is desired in the Region's plans after they have been approved by the Forester, the matter should be taken up immediately, and his approval obtained.

Regional Forester

The Regional Forester will be responsible for the preparation of the plan for conducting each project and will designate a properly qualified man to serve as chief of party. He will also determine the degree of intensity with which the work shall be done, allot the necessary funds, and select and hire the technical personnel. The Regional Forester will issue specific instructions to the Supervisor regarding the handling of the project, and a representative of the Regional Forester will visit the project with sufficient frequency, preferably in company with the Forest Supervisor, to make sure that the work conforms to a uniform standard from both an administrative and a technical standpoint. It is especially important that the regional office shall furnish leadership and advice in determining proper utilization standards, in establishing the best management practices and in making certain that the management plans are sound and adequate to meet the real difficulties and problems concerned on each allotment.

The Regional Forester may, without reference to the Forester, initiate grazing survey projects which do not involve special funds. When projects are initiated that call for work to be done exclusively by local Forest officers on contributed time, it is desirable to have an experienced grazing surveys man demonstrate the methods in the field, help start the work, and give general directions for the development of the management plan. Valuable data are obtained in this manner. In addition to obtaining data, this work is of great value in training the administrative personnel in range management.

The Office of Engineering of the Regional office will furnish the control necessary for the type of map needed and if possible will prepare the map as well. Upon the completion of the field work the Office of Engineering will prepare the tracings and finished maps for the project.

Forest Supervisor

Grazing surveys, including both the field work and the development of the management plan, is primarily a Forest activity carried on to meet local needs. The responsibility for the quantity and quality of work will rest with the chief of the survey party under the direction of the Supervisor.

As the prime purpose of surveys work is to gain full knowledge of the grazing resources and their best use, the members of the Forest force should use every opportunity to impart all the information they have concerning these subjects to the project organization, as well as to gain at first hand all the information they can from the surveys work. Such assistance should be specifically provided for in the Supervisor's and Ranger's work plans. The ranger will be expected to assist in the actual field work for a sufficient length of time to fully understand the methods employed in obtaining the information and the standards required.

In addition each ranger should be assigned to the compilation and management plan work for a sufficient length of time to enable him to make necessary alterations in the plan when he assumes responsibility for its application and maintenance. It is also highly desirable for the Supervisor and assistant supervisor to become familiar with the field and compilation methods employed. Making such assignments is, however, a desirable practice, and the Supervisor should take advantage of the opportunity whenever the other duties of the ranger permit. The members so assigned will be under the direction of the project head while they are engaged upon the surveys work.

The only activity that should take precedence over the project work by the surveys organization is that of fire fighting. The surveys organization will be expected at all times to keep on the lookout for fires in the region where it is working and, if necessary, to assist in the suppression of all fires within striking distance of its location.

The preparation of management plans from surveys data is a joint responsibility of administrative officers and surveys men. The plans should represent the experience and judgment of administrative officers as well as the observations and recommendations of the surveys men. Any difference of opinion between the Supervisor and the project head with regard to the plan which cannot be settled by them will be settled by the Regional Forester. The Supervisor will approve the final management plan and thus assume equal responsibility with the surveys man for it.

PRELIMINARY CONSIDERATIONS

Preparation for Field Work

When a project has been decided upon and approved by the Forester, plans should be perfected so that everything will be in readiness on the date set for starting the field work. The Supervisor should be notified as early as possible by the Regional Forester and instructions sent him as to all the equipment, data, and other things he is expected to assemble prior to the initiation of field work.

Before the beginning of field work the responsible surveys man will obtain the necessary field equipment and assemble and review all maps and other data that will be needed in the field, comprising the following:

1. Sufficient number of sets of topographic maps on the scale, preferably, of two inches to the mile although one-inch scale maps may be used if types are large and topography is not rough. If the available map is not on the desired scale, photographic enlargements or reductions may be made in the Region or by the Washington Branch of Engineering. Unmounted copies may be used by the examiners for typing in the field. Several copies of the map on a one-inch scale printed or mounted on cloth should be secured for general reference purposes.

2. Status of lands, all alienated areas, and especially areas involved in the issuance of "on and off" (Reg. G-3) permits and private land (Reg. G-4) permits.

3. Proper township assemblage by the Regional Office of Engineering of Land Office surveys for the area to be covered.

4. Locations of known section corners and of as many as possible of such cultural features as buildings, fences, corrals, roads, trails, driveways, improved water developments, telephone lines, etc., including locations by special surveys.

5. Locations of and data on poisonous plant areas on which stock have been known to die periodically and which require investigation with a view to determining a plan to prevent further loss.

6. Names and class of permittees, numbers and classes of stock grazed, and allotments used.

7. Table of palatability for each class of stock of the important forage plants, expressed in percentages.

8. All phases of the present grazing plans and statements of objectives should be reviewed, including Supervisor's and Ranger's annual reports for several years, Regional office allowance letters, grazing inspection reports, allotment boundaries, seasons of use, salting and distribution plans, water and range improvement plans, and reports and plans regarding range-destroying rodents.

9. In connection with the correlation of grazing and other uses of the Forest, the following information and data should be obtained:

A. Under timber use, the cut-over lands, lands being cut, and lands proposed to be cut within five years, planted areas and proposed plantations, as well as a timber type map for field use if available.

B. The value of each watershed, as for municipal water supply, irrigation, or power; and areas closed to grazing or on which grazing is restricted for the purpose of watershed protection.

C. The population of each big game species; approximate range; seasonal use of areas; areas of introduced game; plans for handling, developing and utilizing; boundaries of refuges, present and proposed; and any restrictions on grazing to provide for game. In addition careful notes should be made of the occurrence of smaller fur-bearing animals, upland-bird species, etc., and of the means by which grazing can be better correlated with the management and protection of these forms of wild life.

D. The general recreation plans, public camping grounds, summer home sites, and other recreational features which might have a bearing on future grazing plans.

E. On Forests where fire protection is unusually important it may be advisable to determine the areas of greatest fire hazard, general fire-trail plan, and possibly the fire-control plan.

F. Data regarding any areas used for experimental purposes.

The above data will be secured from the Regional Forester's and Supervisor's offices or from any other reliable source. As much of the data as possible should be entered on one of the cloth or mounted maps for reference in the field.

Before the party goes into the field, the chief of party, preferably in the field with the supervisor and rangers, should familiarize himself with the Forest or the part to be covered, in order that he may be able, upon consultation with the supervisor, to decide upon the place to start the work, the route for covering the Forest, the location of camp sites, general conditions, and general phases of present management.

Field Season

The type-classification work should not begin until the season is sufficiently advanced that there will be a representative growth of forage on the ground. Insofar as possible, the work should be so organized that the lower elevations, where growth is earliest, will be covered in the forepart of the season, the higher elevations as growth advances, and other lower areas in the fall when the higher areas may be covered with snow. The work should continue in the fall until grazing or weather conditions prevent accurate classification.

Control for Range Classification

Base Map:- A reliable topographic map is needed in the preparation of a grazing-management plan of the highest type, and it also facilitates range classification. It is, therefore, highly desirable to have such a map. Topographic maps made recently by the U. S. Geological Survey, or by some timber survey crew or other organization, will usually serve as a satisfactory base for the grazing surveys and should be used wherever they are available.

If such a map is not available, the Office of Engineering should make one if possible, especially when it will be of value for the general administration of the area to be covered. Only in the most urgent cases, however, should survey funds be used for making topographic maps, and then only upon approval of the Forester. In such instances the topographic work may be done previous to and separate from the range classification.

If a satisfactory topographic map is not available as a base for surveys, the drainage and outline of ridges and inaccessible cliffs will be carefully mapped by the examiner, and notes will be made of steep slopes, cliffs, ledges, and such features.

Control:- It is necessary to have definitely located points on the area being covered in order properly to tie in the work. Every three sections, and preferably every two, should have an accurate tie point. If satisfactory Land Office surveys have not been obliterated, they will serve admirably, provided they have been reconciled to the primary control and the topographic map. This reconciliation and the establishment of control where necessary should be done by or in cooperation with the Office of Engineering. The Regional Forester will decide upon the requirements in each case.

Where topographic maps are made or control points are established by special Forest Service crews, at least three points in each township should be permanently marked or monumented, and one point to every three sections should be marked in a sufficiently permanent manner in the course of the work to suffice for control during range classification.

P R O C E D U R E I N T H E F I E L D

General Statement

It is impracticable to set up one arbitrary standard to which the field work in every project should conform. The general character of information obtained should not vary materially as between projects - it should be consistently accurate and reliable, but the intensity of the field examination and the amount of detail in the data may vary according to the importance and complexity of the grazing and related problems. The amount of experience of the survey crew will determine

to a degree the intensity of the work at the outset but as soon as the proficiency of the men will permit the intensity of the work should be adjusted to the actual administrative needs.

Size, Organization and Qualifications of Party

Experience has shown that a party made up of a chief, three or four temporary or permanent assistants, and one combination cook and camp mover constitutes the most efficient, economical and practical organization where the field work is done intensively. A larger party requires too frequent moving of camp and too much camp equipment. On the other hand, a crew of less than four field men can not be handled with much less outlay for cook and moving equipment than is required for a party of four or five men. Of course, the field men may do their own cooking and moving, but such work slows down the actual field work and offsets any reduction in cost. These items, as well as the size of the job, the accessibility of the country to be covered, the number of qualified men available etc., should be considered in determining the size and make-up of the crew.

Chief of Party

The chief of party should be a man of good judgment, thoroughly trained in the technical work, and with considerable administrative experience in grazing. He must be able to handle and direct his men and cooperate with local Forest officers and stockmen. He should have had at least two seasons on grazing survey field work, one or more seasons on compilation of data and preparation of grazing management plans, and experience in the application of such plans. He will be directly responsible for the conduct of the work on the ground, and will be expected to lay out the work of the men in the field, see that the project plan and field methods are thoroughly understood and followed by the men, train them to observe and analyze conditions, take measures to secure uniform results, exercise discipline, keep the data in proper form so that if necessary it may be turned over in understandable shape to a successor, order supplies through the Supervisor or Ranger or directly in the field when good business so directs, and maintain a check on expenditures. He should become thoroughly familiar with conditions, utilization, and management on the area as a whole, in order to be able to participate in the preparation of a comprehensive management plan at the completion of the project. At the close of the field season he should direct and aid in the assemblage and compilation of all data for the management plan, and with the Supervisor and rangers prepare the final plans for the Forest or parts of the Forest covered.

The chief of party will designate the particular duties and work of each member of the party. Arrangements should be made to assign as much camp routine as possible to various members in order to relieve the chief of the greater part of such work and leave him free for the required amount of supervision and constructive work.

Other Members of Party

Men with a natural inclination toward the work, with college training or its equivalent in botany, forestry, geology and soils and animal husbandry, with some practical experience in range and livestock management, and with promise of fitting into the work will be chosen as temporary assistants. Because of the valuable training it affords, now technical grazing men should have at least one year's experience in grazing surveys. If they have not had this training, they should be assigned to take the place of temporary assistants. Usually, however, it is not possible to make up a crew entirely of permanent employees, and temporary men should be chosen from among advanced students in botany, forestry, and animal husbandry who desire to enter grazing work, or from among men who might otherwise qualify. Because of the strenuous character of the work, especially when done on foot, men must be in good physical condition.

By every means possible the whole party should be given an insight into the broader phases of the work, its purpose, and the use of results, This is of utmost importance in arousing a personal interest in the work, which is essential to a high degree of accuracy and efficiency. If any members of the party do not take a proper interest in the work, it is advisable that they be replaced by men who will.

The cook and teamster-packer fills a position of no mean importance in a field party. On him depends, to a large extent, the welfare and morale of the other members of the crew. He should be able to do good plain cooking in a sanitary and economical way, be willing to serve meals at whatever time the men get into camp, and possess an agreeable disposition. He should assume charge and take care of all equipment in camp during the absence of the other men. He should know how to handle horses and take over the responsibility of their care. If conditions justify a separate teamster or packer, he should be chosen because of his proficiency in such duties and his familiarity with the region.

Field Methods

In order that the new men may early in the work gain a definite conception of the use to be made of the various data collected, all the steps connected with the field work and the preparation of a complete management plan should be covered for a sample unit. For this purpose a suitable allotment should be selected as soon as the men become familiar with the mechanics of the field work.

Typing and note-taking in the field will be done ordinarily by each man working individually. Each examiner should be provided with all equipment necessary. The chief of party will designate the units or areas to be covered by each examiner from each camp.

The sections as shown on the Regional office assemblage will ordinarily be used as the units for the correlation of notes and type descriptions. In surveyed country the regular Land Office sections should be used. In unsurveyed territory the area should be subdivided by imaginary lines to correspond as nearly as possible with the section lines as they would fall, and each section should be numbered according to the Land Office method unless the topography is such that natural topographic units would prove more practical. Using the section as a unit for note reference does not necessarily require using the section as a unit of work in the field. Consideration should always be given to the topography in deciding the area to be assigned each examiner so that there will be no undue crossing of steep canyons or high ridges in covering the area, unless the type classifications would suffer through the adoption of such a course.

Mapping in the Field

The intensity with which types should be examined will vary considerably. The minimum requirement is that the examiner should see enough of each type to obtain a reliable estimate of its density and composition and to determine the various conditions that would affect the practical use of the type.

Where types are small or variable, or where grazing use is intensive, the areas should be covered on a basis equivalent to passing twice through each section and mapping at least twenty chains on each side of the line traversed, with sufficient offsets to obtain the necessary information for all the types, and properly map their boundaries. This means that the examiner will have been within one-fourth mile of every point on the area covered and will have covered it as much more intensively as is necessary to obtain the essential data.

In very rugged or barren country, or where the forest cover is too dense to permit grazing, the types need examination only to the extent necessary to be assured that no usable feed areas are overlooked. Where the types are large and uniform, crossing the area the equivalent of once through each section will be sufficient. Care must be exercised that no accessible pockets or other usable areas of forage are overlooked. The examiner must decide in the light of his instructions from the chief of party when a basis of less than twice through a section is sufficient.

The procedure in mapping and examination will depend largely upon the accuracy and detail of the map, the kind of control, the topography, and the amount of detail to be mapped. If the topographic map is accurate, and if the type is governed locally, to a large extent, by the topography, the types and other data can be located and mapped with reference to topographic features by pacing a sufficient distance from known points to make the work reliable. Maps sufficiently accurate for reliable control are the exception. Only the recent U. S. Geological Survey quadrangles and the more accurate Forest Service maps have been found accurate enough for use in this manner.

In all other instances where the preparation of a base map is not involved the examiner will cross the area in a systematic manner by compass and pacing from established points, with checks on as many points as it is possible and practicable to make. On areas surveyed by the U. S. Land Office, if the work is not so old that most of the corners have been obliterated, and if the topographic map and the Land Office survey have been reconciled to each other, section and quarter corners will be used as control points, and section lines and centers of sections will generally be followed. If there are no Land Office surveys, or if such survey corners have been largely destroyed, other control points, either those located expressly for this purpose or monuments left from earlier topographic mapping, will be available.

The following data should be obtained by the examiner and shown on his field map:

Grazing Types.-- The area should be classified into types and subtypes and mapped in accordance with the outline given under the section on "Standard Classification of Forage Types". Such important areas as parks in dense timber, clumps of timber in parks, and other similar type changes down to 5 acres in size, if they are important landmarks, should be mapped. Unless some marked contrast of this character exists, a change in type of less than 20 acres should not be mapped. Special attention must be paid to the mapping of inaccessible areas which come under Type 7. Areas which are inaccessible only because of lack of practicable development and which may later be opened should not be mapped as Type 7, but they should be typed and their inaccessibility noted. If definite determination as to accessibility can not be made by the examiner, a note should be made of the area, and the case should be referred to the chief of party for final decision. As it is inconvenient to carry a set of crayons in the field, the types should be designated by number. Any areas not usable by domestic animals but available for game should be examined and a write-up made of the vegetation. Forage acres for game need not be computed unless there is immediate need for that information in management. However, the density and composition of all plants used by game should be recorded in form which may be compiled when needed.

Soil Erosion.-- Accelerated erosion due to removal of virgin vegetative cover has attained such importance in all forms of land management that it is increasingly necessary to take it into account in range management. The rock formation and the condition of the soil with respect to erosion should be carefully noted for each forage type. Any variation in the character or condition or the soil attributable to aspect or other topographic features should be reported. A summary of the erosion situation should be written for each management unit. From the information collected in the field and otherwise available a soil and erosion map should be prepared as a basis for determining where control measures are needed and for correlating range management with soil management.

Topography.-- The topographic map should be checked in the field during the course of the work, especially as to the location of main drainages and main ridges. The examiner should revise the topography or add details if very noticeable errors or omissions are discovered on the topographic map.

Drainage and Watering Places.-- All drainage lines and watering places should be shown in the manner indicated in the legend. Special attention should be given to the mapping of water facilities for stock, as they are a controlling factor in range management. The examiner should check all the water on the original topographic map and add the minor watering places which usually are omitted. All water must be carefully located.

Culture.-- Buildings, fences, corrals, roads, trails, telephone lines, and other cultural features should be accurately located, and those already shown on the map should be checked for location.

Alienated Lands.-- Time need not be spent in the field in accurately checking the boundaries of lands shown in the status record, as it is assumed that the survey of such lands is correct. Fences and other improvements on such land should be sketched in. If these lands are or may be used in connection with Forest range, they should be gone over and classified as though they were Forest lands.

General.-- Other data that should be shown on the map include: badly overgrazed and depleted areas, poisonous-plant areas that have caused or may cause losses of stock, areas infested with range-destroying rodents, areas inaccessible to stock, and salt grounds both satisfactory and unsatisfactory, as well as suitable locations for other salt grounds. If special notations, other than those included under the legend, are necessary on any Forest, they should be made by the chief of the party. Each examiner should be given a copy of the special notations, and they should be strictly adhered to. Special notations made on a field map for any area or unit should be recorded under heading "Special Notation" on Form 764 or 764b.

Field Notes

Type Descriptions.-- Each type and subtype will be written up on Form 764a to include the following:

1. Name of Examiner, Sec., T., R., Date.

2. Brief description of forest growth on each grazing type, including:

   (a) Species (by standard types) - age (saplings, poles, veterans), density (scattering, open, medium, dense), and such general information as may be desired by Forest Management and agreed to by Range Management.

   (b) Reproduction - character of, and extent of injury, or benefit from grazing. Give class or classes of stock responsible and species and height of trees injured.

3. Description of herbaceous and shrub vegetation, including:

(a) Average density - the proportion of the ground surface actually covered by herbaceous or shrubby vegetation within reach of stock, expressed in tenths, 10/10 indicating that the vegetation completely covers the ground.

(b) List of the important forage plants found on the type segregated according to the three classes - grasses and grasslike plants, weeds, and browse, with percentage of the whole made up by each class; and with the relative abundance of each species expressed in percentages. Prominent worthless species should be listed separately and if desired, their abundance may be expressed separately.

(c) Palatability percentage of the type, i.e., the percentage of vegetation within reach of stock which is of value for forage.

(d) Forage factor.

4. Type comments, including:

(a) Soil - rock exposure, character of soil, depth, moisture, (dry, moist, wet), humus cover, character and extent of erosion.

(b) Adaptability of use - degree of suitability to cattle, sheep, game, or other stock, and to common use, with reasons therefor.

(c) Proper season of grazing, from the standpoint of the value of the vegetation for the use required.

(d) Degree and extent of utilization - overgrazed, undergrazed, properly utilized, eroded; reasons for the conditions.

(e) Poisonous plants or range-destroying rodents, if any are present.

(f) Damage to forage by fire resulting in changes in vegetation.

(g) Any other desirable changes in present management to obtain best use of the type.

(h) Contributing factors affecting forage-acre allowance and any advisable restriction in the use of specific areas.

As soon as the examiner becomes proficient the specific comments listed under headings 2(a) and (b) and 4(a) - (h) should be summarized for the entire area covered by him from one camp as a single unit.

Of the above headings it is believed all are self-explanatory with the possible exception of 3(a), 3(c), and 3(d).

In estimating the average density, the spread of the vegetation above the ground must be carefully considered. The density of grasses should be based on the spread of the grass, tuft or stem when it is grazed to the proper extent, with a consideration for its perpetuation, rather than on the full spread of the plant before grazing or on the total use of it. The density of more or less upright weeds should be based on the amount of ground that appears covered when the vegetation is viewed from directly above. In estimating the density of spreading weeds, the surface covered should be judged as when the stems are raised seventy degrees from the horizontal. The density of browse should be determined by the portion of the ground covered by that part of the browse that is readily accessible to the stock. This may exclude from the estimate the interior or dense clumps. Any oak or other brush that forms an upper story beyond the reach of stock does not enter into the density estimate. Confusion sometimes arises in the minds of examiners about a double story of vegetation, as, for instance, if there is an open stand of oak within reach of stock with an understory of other vegetation. As this condition usually results from the crowns of the browse being open, the understory may be considered as merely filling in the openings. Care must be exercised that the density estimate represents an average for the type as a whole.

Palatability, as used in these instructions, is the degree to which the annual growth of herbage within easy reach of stock is grazed when a range is properly utilized under the best practicable range management. The percentage of the readily accessible annual growth of species that is grazed when the range is properly utilized determines the palatability of the species. As the palatability of individual species will vary with conditions, in order to determine the average palatability of a type, one should first estimate the palatability of each important species within that particular type -- the class of stock, the composition of the vegetation, and the proper time for using the range as a whole all being considered. The palatability figure should then be multiplied by the proportion of the stand represented by the species. The addition of the resultant figures for all species will give the palatability of the type. This method is much more accurate than making a guess at the average palatability of the type. The percentage should not be in excess of what may be grazed under proper use and still allow the important palatable forage plants to maintain their stand and vigor year after year. As a basis for individual palatability figures a palatability list prepared under the direction of the Regional Forester will be furnished the chief of party. The list should be revised, if necessary, in the light of further careful observations.

Palatability estimates for a given type should be based upon the class or classes of stock which it is definitely planned will use the area. If common use is contemplated estimates should be made upon that basis. In view of the probability that in the future many allotments will be used by a class of stock different from that immediately contemplated, a converting factor should be determined which will specify the relative capacity of

each general type-class for the two principal classes of stock which may be allotted to the area covered by the surveys project. The converting factor should be determined after the field data have been compiled. Separate carrying capacity estimates should be made for game animals, based also upon a converting factor determined for each main type.

The forage factor for the type is the product of the average density of the type times the palatability. This should be determined in the field in order to fix more clearly in the minds of the examiners the forage value of each type and to prevent any discrepancies in "jibing" the parts of the same type examined by different men.

Other factors, such as vigor and volume of growth, continued growth throughout the season, true feeding value, growth characteristics as affected by grazing, actual accessibility of feed, and many others enter into the problem of the extent to which stock will graze on a type. It is realized that they should be considered in estimating the forage factor. However, until satisfactory means of evaluating them have been developed, they will be noted and recorded in the field and the information used in connection with the adjustment of forage-acre allowances and carrying capacity estimates rather than for making changes in density and palatability estimates.

It is of prime importance in making estimates that the crew have a uniform idea of density and maintain uniformity throughout the work on a Forest. Every estimate of a type should be based on a mental comparison with an acre of vegetation with 10/10 density and this standard should be clearly fixed in the mind of each individual examiner at the beginning of each season. With a common standard in mind, and with periodic checks by the chief of party, it should be possible to maintain uniformity among the estimates made by various members of the crew. This uniformity is essential if the data secured by the party are to serve the highest purpose.

A write-up of every type and subtype of the herbaceous and shrub vegetation, (see headings 3(a)-(d)) for each section or natural topographic unit should be available. If the type or subtype is the same as that in an adjoining unit it will not be necessary to make a separate write-up for each type, but a reference should be added showing where the type descriptions may be found. Care should be exercised, however, that the write-up or cross reference be complete for each type in <u>every</u> section and that cross references be made only to types within the immediate vicinity.

Type or subtype boundary lines should not stop at a section line when the sections are matched or "jibed", but should always close. Density estimates or forage-composition write-ups are not necessarily identical in the same type or subtype in adjoining sections, but there should be no considerable discrepancy without a subtype division line or explanation.

Section and Natural Topographic Unit Descriptions.-- Each examiner should comment upon the following topics for the sections or natural topographic unit he covers from each camp. The chief of party will make such a write-up for complete grazing allotments.

(1) General elevation, topography, and drainage as they affect accessibility of range to stock, drainage systems, whether flat, rolling, or rugged; depth of canyons; steepness of slope; rock exposures, slides, boulders, cliffs; general accessibility. Inaccessible areas will be outlined on the map. The usability, expressed in percentage, of any type when entire type can not be fully used because of steepness, etc., will also be recorded.

(2) Character of watering places (stream, lake, pond, spring, seep, well, tank, etc.): Permanent or temporary (if temporary, state usable period); state of development and need for improvement or maintenance; nearest permanent water; character of country, particularly the slopes; surface necessary for stock to traverse in order to reach water; relative amount of water available as compared with carrying capacity of the range; when intermittent water dries up; recommended improvement or development.

(3) Range-destroying rodents: Important species of rodents, acreage infested and damaged, and location by type.

(4) Salting plan: Suitable salting places will be indicated on the map. In addition, notes will be entered regarding present arrangements for salting on the area, recommendations will be made for changes, and the reasons therefor will be given.

(5) Handling stock: As much information as possible will be obtained and recorded about the manner in which stock are being handled on the area, including herding of cattle and sheep, bedding of sheep, condition of bed grounds, evidences of excessive trailing, and other phases of management, with recommendations of needed changes and reasons therefor.

(6) Range improvements: Present improvements on area, and those needed for proper handling of stock on the range - drift and division fences, corrals, bridges, trails, driveways, and others.

(7) Game: Indications of game on the area, seasonal use by game, and other important matters regarding game welfare, as well as any grazing restrictions necessary for the welfare of game.

The chief of party will familiarize himself with each area and check up on all necessary data for preparing the management plan, but each examiner will also gather as much information as he can. This is primarily for two reasons. It gives each man training he would not otherwise obtain, and, especially if reasons for recommendations are given, he is led to think constructively, and the work becomes more than a mechanical undertaking. Furthermore, the examiner covers each area much more intensively than the chief of party, who then has a check against his own judgment.

All of the mapping and notes should be completed in the field and not left to be done in camp. Immediately upon return to camp the field notes of each unit may be filed in a 5 by 8-1/4 inch manila envelope, labelled with the proper section, township, and range numbers or with the name of the definite natural topographic unit, together with the examiner's name and the date of examination.

Transfer of Data to "Camp Map"

Transferring the data on the field map to the "camp map" should be done by the chief of party or under his immediate supervision. So far as possible, this work should be performed each day upon completion of the field work. The transferring will be done before camp is moved, in order that, if necessary, any wide discrepancies may be checked in the field.

Care will be taken that the types, subtypes, and forage factors properly match those for adjoining maps. Forage-factor estimates should be checked in order that there may be no discrepancy without explanations or divisions into subtypes. The map may be properly colored with crayon colors; or each type clearly designated by a type symbol, type numbers, subtype designations, and forage factors should be written on each type; and any special notation used should be explained on the border so that the map may be self-interpreting. Whenever there is not enough time in the evenings for the completion of this work, the coloring may be posponed for the time being, but it is important that type lines and all other data be transferred as the work progresses. Whenever men responsible for adjoining sections cannot agree on some point, the discrepancy will be referred to the chief of party. If in his judgment it is necessary in order to maintain the general efficiency of the work, he should personally settle the question by a field examination.

Plant Collections and Economic Notes

The work of collecting plants and recording economic data will go hand in hand with the surveys. During the first few days in the field, when members of the party are out together for preliminary training, as many as possible of important herbaceous and shrubby species growing on the part of the Forest occupied and not previously collected will be collected in triplicate. As the work progresses with the advance of the season, additional collections will be made, and as soon as practicable after the survey starts there will be a collection in triplicate or quadruplicate of all important herbaceous and shrubby vegetation growing on the part of the Forest covered. As rapidly as quantities accumulate, Form 767 should be filled out for each specimen from the field notes taken at the time the plant was collected, and the specimens should be forwarded to the Regional office. One set (unmounted) will be sent to Washington for identification, and the other two or three sets will be retained. After the identifications have been received the retained sets will be mounted. One of these sets is to be filed in the supervisor's office; another is to be kept in the Regional office; and, if there is still another set available, it should be furnished to the ranger.

The party will be provided with copies of the flora with botanical keys that is best adapted to the region, and every effort will be made by members of the party to identify the plant species in the field. These identifications will be only tentative, as final identification will be made in Washington; but they will serve to make members of the party more familiar with the vegetation, and this identification will ordinarily be close enough for the correlation of common names. Common names and designations will be standardized as far as possible.

Common or scientific names, or standard abbreviations will be used in referring to the plants in the field and in listing them on Form 764a, and all members of the party will adhere strictly to the accepted names and designations. Care should be taken that the names chosen are entered in a plant catalogue. After formal identifications have been received, the correct names, both common and scientific, will be correlated and listed in the catalogue.

At the close of the field season the chief of party will revise the old economic notes, and prepare new notes for each additional species collected. Copies of these will be furnished to the Regional and Washington offices.

Relative Forage Value of Range Plants

It is very important that members of the survey party learn the relative palatability of the principal range plants. Plants are eaten more readily under certain conditions than under others. Affecting palatability are such conditions as the combinations in which plants occur in the type, intensity of grazing, season in which they are grazed, mechanical features (awns, etc.), and, to some extent, the familiarity of the stock with the classes of vegetation. When the choicer plants have been grazed more closely, the less choice plants will be taken to a greater extent. The palatability estimate must take all those factors into consideration and be based on the proper degree of utilization under the best practicable management. Because of the many factors entering into the palatability estimates for any species, the percentage cannot be absolute but will often vary 10 to 15 per cent for each class of stock. However, great care should be exercised not to deviate from well established palatability ratings on account of local conditions of utilization that may be due to poor management. As the survey progresses the palatability of the various species must be studied and revised with the approval of the Regional Forester to meet the conditions of the locality to which it is applied.

Training and Checks for Uniformity

Uniformity and accuracy in estimating density, forage values, and utilization are essential. The first week of the season and as much longer as necessary the crew, if made up of inexperienced men, will work together in the field for the purpose of training in the methods of work and in making uniform estimates. Each member will be assigned to individual work as soon as the chief considers him competent.

At intervals of three or four weeks throughout the season the crew will work an area together for the purpose of checking estimates and clearing up questions. Throughout the season the chief of party will continue individual training of crew members and make such additional checks on the work of each as may seem necessary. The chief of party must bear in mind that responsibility for training men rests largely with him.

Special Data to be Collected by Chief of Party

As the field work progresses, the chief of party will collect and record special map data and notes for each allotment or natural distribution unit for use in preparing the management plan, the object being to get the best line possible on all phases of range management while he is on the area and leave as little as possible to be figured out after he leaves the field. The chief of party should always correlate his observations closely with the supervisor's and ranger's knowledge of past conditions and use. These data will include:

1. Notes on allotments, together with recommended changes in their boundaries. An allotment, as far as practicable, will comprise areas bounded by definable topographic or other features that serve more or less as barriers to stock and where stock may be handled and distributed to a large extent independently of management on other units. Existing allotment boundaries should not be allowed to obscure the best and most logical boundaries in view of all the facts derived regarding topography, degree of utilization, seasonal forage, distribution of water and other factors limiting the management of stock on the unit.

Allotments, if not already named, should be tentatively named according to some topographic feature such as a stream, ridge, or peak. Names already in use will be adhered to when they are distinctive and do not conflict with use elsewhere.

2. Names of topographic and cultural features. This information can best be obtained from local Forest officers and settlers during the progress of the work.

3. Information, by allotments or divisions, about numbers of stock and seasons permitted and grazed, with recommended changes; character and amount of drift, and recommended control of drift.

4. Determination of the proper division of the range among the different classes of stock to be shown on map.

5. Determination of proper grazing season for each division and the seasonal zones on which stock can be controlled with reasonable expense for fencing, herding, or other control measures.

6. Conditions of range and present degree of utilization of different parts of each allotment; location and extent of areas overgrazed or eroded; location of injury to reproduction and degree of injury on each area; areas partially or totally unutilized, with factors responsible;

past use of the range as it might influence changes or future use. The effect of these factors upon forage-acre allowance per head of stock should be considered. This will require correlation with needed range improvements, and methods of handling stock.

Areas to be covered late in the fall should be observed early in the season, and the degree of utilization of areas covered early should be checked during the latter part of the season.

7. Methods of handling stock, present and recommended, including adequacy of present salting plans and desirable changes; range riding; methods of herding sheep, including bedding out and open herding, condition of bed grounds, etc. Conditions will be carefully noted and recommendations made to secure proper handling.

8. Areas in need of revegetation and plans for assuring the protection necessary to obtain natural revegetation, as well as special areas in need of artificial reseeding, and plans for handling them.

9. Information by allotments as to range improvements and water development, covering the condition of present improvements, need for and cost of maintenance, and needed improvements for proper use of the range, with cost and relation of each project to forage utilization.

10. Data on game, especially in relation to grazing. On Forests where game is an important resource and where there is now or later may be considerable conflict with the grazing use, the following points will be studied as closely as possible in connection with the surveys work.

(a) Correctness of population figures for big game animals.

(b) Adequacy of summer and winter range for game with respect to:

1. Available forage for game.
2. Grazing by domestic animals.
3. Settlement and fencing.
4. Adaptability of range now used.

(c) Habits and life history of game as far as they can be observed.

(d) Data on effect upon game of grazing by domestic stock.

11. Poisonous-plant problems. Acreage and species, and where important losses are occurring, class and approximate number of stock lost annually, general conditions surrounding use of the area, and possibilities of control and eradication.

12. Changes in range management necessary to prevent undue interference with proper timber production, watershed protection, recreational use, or conservation and use of other Forest resources.

13. A full understanding of each ranger's grazing problems as influencing the use of the range and the supervisor's principal administrative difficulties which might influence future use. This information is urgently needed to enable the party chief better to analyze the management problems and to assist in their solution.

14. An approximate idea of the amount of trespass and present means to control it, with possibilities of better means of control at reasonable expense.

Progress Report

At the end of the field season, the chief of party will prepare a progress report of the work done during the season, one copy of which will be furnished the supervisor, one to the Regional office, and one to the Washington office. This report will include the following; Acreage and part of Forest covered, organization and qualifications of the crew, training given men in the field, methods used, recommendations for future work, and a statement of costs. The cost report will show in detail the various expenditures -- total cost of various operations in the field; cost per acre of surveying, field examination, office, herbarium, moving, noneffective days other than moving; average cost per acre; and average acreage covered in the field per day.

The progress report should be approved by the supervisor and transmitted in duplicate to the regional forester. After review in the regional office one copy of the report should be transmitted to the Washington office together with a copy of the regional forester's comments to the supervisor concerning the report.

D E V E L O P M E N T O F T H E M A N A G E M E N T P L A N D A T A

Following the field work, the data obtained will be compiled, and a plan of grazing management will be prepared. The management plan should be simple, workable, complete, and of such a character that it can be kept up to date. It will be both graphic and written, consisting of base maps, overlay sheets if desired, tabulations, written descriptions, and recommendations for managing the range, handling the stock, and coordinating grazing with the other uses of the forest. It will include the best thought and judgment of the supervisor, rangers, and surveys men. Careful consideration should be given to the views of each permittee whose interests will be affected by proposed changes in management.

The final base type-maps should show as clearly as possible the forage resources and the more permanent features that affect the use and management of those resources. The supplemental base maps or overlays should present, so far as can be shown graphically, the data of a more or less temporary character which are needed for managing the range and handling the stock. The tabulations should show such items as the acreage and forage values of each distribution unit, with the authorized, permitted, actual, and approved use. The written part should give the information on forage and its proper use that can not be shown graphically or by tabulations, together with specific statements on the management of the range, forage resources, and methods of handling the stock.

COMPILATION OF DATA

Base Map

The final/base map should be on a scale of 1 inch or 2 inches to the mile, and should be an accurate assemblage of the best map data available. The assemblage should be made periodically during the field season or shortly after the close of it by the surveys organization if it determined any corrections that should be made. In order that the final map may be accurate, the field map should be carefully checked to see that all corrections and additions have been made and that everything is in form for the final record. The inking in or final preparation of the tracing of this map should be done by the Office of Engineering or by qualified draftsmen under the direction of the chief of party. It should show topography if data are available, drainage, cultural features, land lines, water, and the names of streams, peaks, valleys, and any other important permanent features. So much detail will be shown on this map that fine draftsmanship will be necessary. Coarse lines or lettering will be avoided as much as possible.

The forage-type lines, with type designations and acreages (surface and forage), and compilation unit lines with designations and acreages, should be put on a separate tracing, together with sufficient land or Forest boundary lines so that this tracing may be properly matched over the base-map tracing. Type lines on this tracing should be somewhat heavy, and dotted rather than solid to avoid confusing them with lines for other purposes. The location of type lines should be obtained by tracing them through from the camp map. All transferred data must be carefully checked to assure accuracy.

This plan of preparing two separate tracings permits the making of prints of the base map by the use of the first tracing alone, and these prints may be used for other than grazing maps. Prints showing type and unit lines, symbols and acreages on the topographic or drainage base may be obtained by having a lithograph copy made of the two tracings with one superimposed upon the other. This furnishes a negative from which prints may be made as needed.

Work or Compilation Map

The camp map tracing should be used as the work sheet. When this tracing is brought from the field it should show the Land Office assemblage, alienated lands, type lines, type designations, type values, and allotment, seasonal zone, and distribution unit lines. It will be used as the work sheet for planimetering and compilation.

Compilation Units

To facilitate adjustments of allotment boundaries and of management plans, forage data should be segregated by the smallest practical distribution units. Ordinarily these units would average in size from 2 to 4 sections. Where topographic features do not form such units they should be outlined arbitrarily on the topographic base upon which previously

have been entered the allotment boundaries and then traced through on the work sheet. Each compilation unit should be designated by name or number. Sections may be used as compilation units where considered advisable.

Assemblage for Wall Maps or Atlas Folio

The base map should be assembled into convenient size for wall use or atlas folio. This will be done by grouping as many allotments as will fall within the boundaries of the map of the size preferred. Each unit of grazing use should be complete on one map.

Planimetering

When the topographic compilation unit lines and assemblage map division lines have been put on the tracing, planimetering may begin. In this way planimetering may start soon after the field season ends, and the delay which would otherwise be caused by waiting for the final base map to be prepared will be avoided.

Areas of types will be determined within each section, or topographic compilation unit. The total area of each section or compilation unit should be determined by the planimeter and checked with the Land Office Survey if this is available; then the types should be planimetered and totaled for the section or unit. If an error of ten acres or more per section occurs in the total type area as compared with the total section or unit area, the types should be replanimetered until the error is found and corrected. If the error is less than ten acres per section, it should be apportioned among the various types.

Computation of Forage Acres

The type acreages should be inked in and the corresponding forage acres should be computed by multiplying the number of surface acres by the forage factor. The forage acres should then be entered in ink directly under the surface-acre figures.

Recording on Compilation Sheets

On the unit compilation sheets provided for the purpose, as much of the following data as is pertinent is then entered for each compilation unit:

1. Surface acres.

2. Surface acres of land not subject to Forest Service control.

3. Surface and forage acres of lands subject to Reg. G-4.

4. Surface and forage acres of forest land from which range stock is excluded.

5. Surface and forage acres of all types.

6. Surface acres of water (lakes, etc.)

7. Surface and forage acres of the total Forest range available for permitted stock.

8. Surface and forage acres in each compilation unit.

The totals for the unit will be determined by types (vertical) and sections or compilation unit (horizontal), and the grand totals of these will be checked. This provides for finding and correcting errors in transferring the figures from the work sheet to the compilation sheet and for rectifying mistakes. It also gives the totals for the unit. These totals for each unit should then be entered on the work sheet directly under the number or name of the unit.

This method results in everything being recorded on the work sheet which it is necessary to put on the final base type map and makes possible the duplication of the final plan maps, should the latter be destroyed or lost.

The subsequent use that is made of compilation and work sheets does not justify having copies made, but the originals should be filed in a place safe from destruction by fire.

PREPARATION OF THE MANAGEMENT PLAN

When the compilation is completed, the preparation of the plan is next in order. In the handling of the field work, in the compilation of data, and in the preparation of the management plan, it should always be kept in mind that the prime purpose is to show what the grazing resources are, what their relation is to other resources, what would be their best use regardless of present use, how they may be used best under existing conditions, and what adjustments are necessary to bring about satisfactory management conditions.

The preparation of management plans is the joint responsibility of the Forest Supervisor, the ranger, and the chief of party. It is essential that the plans be based upon the most complete information available and embody the best ideas of all concerned. In view of the fact that the permittees are responsible for handling their stock in accordance with the provisions of the plans and are in a position to know the practical considerations that must be taken into account in range and livestock management, the plans should be discussed thoroughly with the permittees concerned and careful consideration given in the development of the plans to their suggestions.

The plan must be clear and concise and presented in the form most serviceable to administrative officers. It should emphasize the allotment as the unit of management, but it should recognize that in order to understand the action necessary in administering grazing on an allotment it is essential to know what policies or considerations affecting such action prevail over larger units of the Forest. For this understanding it is

necessary to present certain statements of policy and explanatory data that apply to the ranger district or Forest. To avoid repetition such material should be presented under a district or forest heading as the case may be; logically it should precede the discussion of the allotment plans. Statements regarding district or forest policies and conditions should be restricted to those features essential to a clear understanding of the action called for in the allotment plans. Usually a policy or objective or range condition should not be discussed specifically in connection with one unit that applies to a more inclusive or to a less inclusive unit. By following this rule much extraneous matter will be kept out of the plans, repetition will be avoided, and the materials will be presented in a logical manner.

The following material should be incorporated in a plan:

A visualization of the grazing resources; a statement of problems and factors affecting their use; the way in which they are utilized; and specifications for their future use and management.

Plan of action to accomplish recommendations regarding management.

Progress report.

Basic data and detailed information.

Experience has demonstrated that management data may be presented most clearly by means of graphs, maps, and tables. These forms of presentation should be favored and long descriptions used as little as practicable.

The need for presenting the general grazing situation on the Forest in order that the problems on the several allotments may be seen in their proper relationship makes it advisable to develop the forest and district sections of the plan before the allotments are treated.

The basic data and detailed information ordinarily will be used only for reference and should be considered as supplemental to the main plan and, if more convenient, may be kept entirely separate from it.

The essential provisions of the management plan and a desirable arrangement of material are outlined as follows:

I. Forest Section - To be prepared by the Forest Supervisor, if such a plan is not already available in the form of a Resource Management plan, Appraisal Report or comparable record (One copy for supervisor and one copy for each ranger)*

Index

1. Index map (1/4" scale, showing ranger or grazing districts)

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*An additional copy should be made of those sections of the plan of which the Regional Forester desires to have a record.

2. Brief statement specifically applicable to this Forest regarding:

a. General character and extent of forage resources.

b. Economic conditions surrounding the grazing industry on the forest, including brief history, importance of grazing, stability of the business, dependency on forest range, relation to agriculture and other industries in the region, etc. (Very brief and to the point).

3. Brief specifications of Forest needs and policies with respect to:

a. Controlling losses due to poisonous plants.

b. Exterminating predatory animals.

c. Exterminating range-destroying rodents.

d. Correlating grazing with the management of:

(1) Timber reproduction

(2) Watershed values

(3) Game resources

(4) Recreational resources

II. Ranger District Section - to be prepared under the direction of the Forest Supervisor - (one copy for supervisor and one copy for the ranger concerned)

1. District map (1/2" scale showing allotments and C&H Divisions).

2. Brief statement of particular grazing conditions or management needs on the ranger district not covered adequately in the Forest section of the plan.

3. Tables - summary by allotment for government and private lands of: Areas of management units; carrying capacity and seasons specified; use by permitted and exempt stock; and such other information as may be considered advisable to record.

4. Improvement plan summary by allotments.

5. Salt plan summary by allotments.

6. Poisonous plant control plan summary by allotments.

7. Rodent control plan summary by allotments.

8. Predatory animal control plan summary by allotments.

III. Allotment Section - to be prepared by the surveys men and administrative officers jointly, in cooperation with the permittee (One copy for supervisor and one copy for the ranger concerned).

1. Description - outstanding topographic, vegetative, or other conditions on the allotment not shown graphically, which affect the handling of livestock and grazing use.

2. Brief history of grazing use as affecting present range conditions.

3. Present grazing use and analysis of range management problems.

4. Related factors affecting grazing use.
   Timber reproduction, watershed (including erosion) wild life, recreation, poisonous plants, predatory animals, rodents, etc. The treatment of these topics here should be restricted to a concise discussion of the specific problems presented by each on this allotment.

5. Recommended grazing use.

   a. Specific objectives in management adequate to place range management on a thoroughly satisfactory basis.

   b. Definite standard of forage utilization. Concise definition of the condition in which important plants in important types in different parts of the range should be left at the end of the grazing season in order to attain the desired objectives in management. An equally clear definition of the condition in which these plants may be left to meet the actual conditions of range management.

   c. Proposed plan of management to be put into effect as soon as conditions permit:

      (1) Class of stock

      (2) Numbers of stock

      (3) Season of grazing

      (4) Distribution of stock by means of:

         (a) Salting

         (b) Riding

         (c) Water development and control

         (d) Fencing

6. Program of action for current year.

   a. Plan of management to be put into effect during current year.

      (1) Class of stock

      (2) Numbers of stock

      (3) Season of grazing

      (4) Distribution of stock by means of:

         (a) Salting

         (b) Riding

         (c) Water development and control

         (d) Fencing

   b. Specific projects to accomplish definite objectives already listed or which new developments make advisable (to be embodied in ranger's work plan.)

7. Annual grazing progress report. (An integral part of ranger's annual grazing report for his district.)

   a. Concise statement of progress in accomplishing the action prescribed for the current year and action taken but not provided for in the plan.

   b. Specific recommendations for action to be taken next year.

8. Maps.

   a. Base map for wall use or atlas folio, 1" or 2" scale, mounted or printed on cloth, showing all permanent features, including grazing types, in color, with their surface and forage acreage and each compilation unit with its designation and acreage, assembled by allotments for the entire ranger district for wall use or kept separate by allotments in an atlas folio.

   b. Base maps similar to the above but uncolored, (or overlays to be used with the colored base map).

      (As much of the data called for under captions (1) to (12) below as is suitable for tabulation should be prepared in tabular form and the tables kept with or attached to the maps. Other data such as distribution units, the location and area of alienated lands, the kind and location of stock water, improvements, salt grounds, etc. can best be shown on the map.)

(1) Acreages, surface and forage

(2) Class of stock

(3) Estimated carrying capacity -- in numbers and animal months.

(4) Present numbers of stock -- in numbers and animal months.

(5) Recommended grazing period.

(6) Present grazing period.

(7) Surface and forage acres per head per month on the basis of estimated carrying capacity and on the basis of present numbers.

(8) Distribution units for cattle or sheep showing boundaries, acreages, number of stock, period of use.

(9) Location, area, grazing capacity and ownership of alienated lands.

(10) Stock water, present and proposed; kind, location, and period available.

(11) Pastures, drift fences, corrals and other range improvements, present and proposed.

(12) Salting plan: Location of grounds, amount of salt, and period when salt should be at each ground.

c. Field maps (one copy for supervisor and one for ranger); 1" scale base maps, assembled by ranger districts, mounted so as to fold and showing such survey and management data as it is necessary or desirable to take into the field for application, check, correction, etc.

d. Permittee maps (where desirable.) 1" scale map of the individual sheep or cattle allotment to be furnished the camp tender or herder. The map should show allotment boundaries, number of stock permitted, and distribution units with numbers of stock, period of use for each, the salting plan, and the location and names of adjoining allotments. The map may be accompanied by such portions of the written plan as it seems advisable to furnish the permittee and by any special instructions needed to secure compliance with the plan. This map should be kept current each season by the ranger.

Range Usability

Judging the degree to which a given range is usable under a practical plan of management often requires greater knowledge of local conditions than the average examiner can be expected to have at the beginning of a grazing surveys project; and yet the degree of practical usability may be a determining element in arriving at carrying capacity and in planning distribution. For this reason it is of prime importance that the representative of the regional office, the forest supervisor and the chief of party reach a definite understanding at the beginning of the project work regarding the limitations as to use of the representative types under the principal sets of physical conditions to be encountered. The chief of party will then be expected to see to it that other members of the crew adhere to this understanding when judging usability of specific types.

Plan Application

Too much emphasis cannot be placed upon the need for keeping the allotment management plans in current use. It is of special importance that the provisions of the plans be referred to when grazing applications are acted upon each year and when administrative plans of work for each field season are under consideration. The plan is the foundation of systematized use in the field and should be used as such. It should be consulted before rather than after action is taken.

Plan Revision

Although stability in management plans is greatly to be desired, the plans must be adjusted to the extent necessary to keep planning ahead of field action and entirely workable. Features of the plans which deal with the history of range conditions, problems in management and their best solution, and basic forage and map data may be considered reasonably permanent. On the other hand, the actual use of the range is apt to change from year to year and specific measures for the betterment of range conditions must be modified to fit changing and unforeseen circumstances. Therefore, the basic data in the plans and maps as outlined under the Forest and District sections and under captions 1, 2, 3, 4, and 5 of the Allotment Section and the corresponding map data under 8 should not be subject to frequent change, but the current action section of the plans and corresponding map data involving headings 6 and 7 and some headings under 8 should be kept up to date each year. This can be facilitated by including only permanent information on the base type map and data subject to change, on the overlays or maps referred to under 8b.

Administrative Adjustments

The practical requirements of the stock industry will be considered as far as the perpetuation and use of the grazing resource and other National Forest resources permit. No recommendations should be made that would require immediate radical adjustments by the stockmen unless specifically authorized by the Regional Forester. The method should rather be that of working gradually toward the desired objective and giving the stockmen time to adjust their business. Recommendations should provide that within two or three years adjustments be carried far enough to prevent any further injury to grazing or other resources.

Grazing Capacity

The grazing capacity of a range unit will be the number of stock that unit can support in good thrifty condition during the grazing season as established by the requirements of the vegetation itself without impairing the sustained productivity of the range and forest growth and without undue interference with the use of other forest resources. Such factors as surface, soil, differences in palatability of adjacent types, range-destroying rodents, game, distribution and character of watering places, class of stock using the range, season of use, length of normal growing season, methods of handling, volume of growth, distribution of stock, poisonous plants, need of improving the vegetation, and special requirements of the area for watershed or recreation purposes all affect the number of stock the range can support properly, and must be taken into consideration in determining the number of forage acres that should be allotted each animal per month.

Areas that are inaccessible because of topography or because water is not available, and areas that must be closed for any reason, should be excluded in arriving at the estimated grazing capacity.

As the number of stock a range should support may change with the improvement of the range, the opening up of hitherto inaccessible range, a change in the management of stock, or the closing of areas for various purposes, the table for recording the grazing capacity of each allotment or division should provide several open spaces for future changes in keeping the records up to date.

Checks upon Carrying Capacity

Estimates of carrying capacity as determined from the survey data should be considered as tentative and subject to revision after trial and careful inspection. It is important that actual use records be kept for each allotment and that they be correlated with utilization estimates at the close of the grazing season. In order to have more definite measuring sticks of forage-acre requirements, specific carrying capacity projects conducted in the main forage types under representative conditions where the number of stock and the period of use are accurately known should be initiated in connection with each grazing survey project and continued over a sufficient period of years to arrive at safe averages.

In cases where carrying capacity tests are already available for the types covered by the survey they may be used of course in lieu of initiating new projects.

Season of Use

The season in which the allotments should be grazed will be determined in accordance with the discussion in "Range Management on the National Forests", Department of Agriculture Bulletin 790, pages 10-16, and such additional information as has been obtained from period studies, plant development records, and especially more intensive studies conducted by investigators on the relation between grazing and the growth functions of plants.

In order that the opening date may be conservative long time weather records should be studied to determine the seasonal variations from year to year.

The plan will show the allotment of stock according to distribution units on the basis of the period during which each may be grazed and the grazing capacity for that period. The Forest Service must first consider the needs of the Forest ranges; but the needs as to seasonal use of outside ranges and ranches also should be outlined both with a view to insuring more stability in that part of the livestock industry dependent upon National forest ranges and showing how the industry can be so adjusted as to meet the proper seasons on the National Forests.

Distribution Plan

The basis for proper distribution of stock can best be determined, where forage-acre estimates are available and forage-acre requirements are known, by dividing the number of forage-acres in any given distribution unit by the forage-acre requirement for the season to be grazed. This figure will represent the number of stock that should be allowed to graze in that particular unit. Where the number of stock is in excess of the proper carrying capacity, the figure representing the forage-acres allotted per head would have to be correspondingly increased in order to provide for even distribution.

Handling Stock

The management plan will describe briefly the methods of handling stock employed on the allotment and will recommend how stock should be handled with regard to herding, bedding, salting, watering, and all other phases of handling stock which affect the use of the forage.

Salting Plan

The management plan will show graphically the present satisfactory salting grounds with dates and amounts of salt. Recommendations on salting will indicate the amount of salt needed in different units, the approximate location of salt grounds or other facilities for salting, and the approximate time of use. The actual location of the grounds needed and the insertion on the salt map are administrative functions to be handled as soon as practicable by the ranger.

Provision for Game

The regional office should furnish available information regarding the extent to which different forage types may properly be used by big game species; also the management needs of game animals, fur-bearers and upland game birds with particular reference to the importance of conservative grazing upon the propogation of these species. This information together with the information collected by the surveys crew and available in the supervisor's office should be the basis for determining the extent to which game animals should be provided for in the management plans, pending the time when adequate game management plans can be developed.

Deferred and Rotation Grazing

This method of handling stock to be successful requires much better control than is ordinarily attained with cattle. No difficulty in this respect is experienced in applying the method on ranges used exclusively by sheep. Deferred and rotation grazing is needed particularly where depletion has gone so far that reseeding is advisable rather than depending upon the vegetative spread of plants already established and where moderate use under simpler management is inadequate to accomplish the desired results. Before deferred and rotation grazing is put into effect careful consideration should be given to all the conditions of management plant conservation and plant propagation to determine if the system is the best under the circumstances.

Allotments

The boundaries of allotments should conform as nearly as possible to natural topographic boundaries. A single cattle and horse or sheep allotment may include several natural topographic units or a single unit, depending upon the number of stock to be accomodated and the nature of the topography. Where several natural units are included these should ordinarily be divided into distribution units for guides in stocking and checking on the range. On sheep allotments these may be camp units.

Personnel

The compilation of surveys data and their general analysis up to the point of preparing the management plans will be done largely by the surveys men and in such office as will most consistently facilitate the work. Pending the development of complete plans the surveys men will discuss their tentative recommendations in conference with the local officers and together they will formulate the plan of action for the coming year. This will provide the opportunity to correlate and coordinate the surveys data and the information of the local officers with the current permanent administrative plans, permit action sheets, and grazing records. Together they will develop the complete allotment management plans.

APPLICATION OF THE MANAGEMENT PLAN

Responsibility for the application of the plan will rest upon the Supervisor. Once the plan is completed and approved by him it will become one of his administrative duties to apply it. All possible assistance should be given the Supervisor by trained men in the application of the data. Whenever possible, the best qualified man on the field work who is available will be assigned to the Forest for a sufficient period to assist the local Forest officers in becoming thoroughly familiar with the principles of the plan and their application. Each year the ranger and Supervisor will determine, in the light of what has been accomplished to date as shown in the ranger's annual progress report, the definite steps to be undertaken during the ensuing year toward carrying out the specifications of the management plan.

Administrative difficulties may make impracticable the immediate detailed application of the final plan. The attempt to apply it at once, if radical changes are necessary, might result in confusion. As outlined in the development of the plan, it will usually be better to secure such adjustments as can be made each year until the objective of the plan has been reached. Within two or three years the adjustments should be carried far enough to prevent any further injury to grazing or other resources. The permittees should be notified as far in advance as possible of contemplated changes and the opportunity thus given them to adjust their business accordingly. Every effort will be made to secure all possible cooperation of the permittees in adjusting allotment boundaries and in determining assignments, numbers, and methods of handling stock. All adjustments made will have as their object the ultimate realization of the management plan.

Adjustments in Plan

Some adjustments in the plan itself will undoubtedly be found necessary after it has been tried out. This may be true more especially of the parts of the plan relating to grazing capacity and allotment boundaries. The grazing capacity estimates as first arrived at will be carefully tested by trial and by study. If the actual use records over an extended period of years supplemented by careful inspections indicate that the capacity of a range should be adjusted, the ranger should make suitable recommendations to the Supervisor. If the proposed adjustments involve changes in the capacities arrived at through the survey, the approval of the Regional Forester should be obtained before applying the adjustments.

Follow-up to Range Surveys

The Supervisor will be responsible for keeping the plan up to date. Each year the ranger will show on his wall and field maps additional information, water found, water developments, other improvements constructed, and all additional cultural features, as well as suggested changes in allotment boundaries and other recommended changes in the plan. These things should be noted first in the field on the ranger's field map and transferred to the wall map before the annual revision is completed in cooperation with the supervisor.

For the first two or three years it may be advisable to have an experienced surveys man preferably one already in the forest organization who is familiar with the project, visit the supervisor's office and help the supervisor and ranger make the adjustments, keeping constantly in mind the needs of the forage and the eventual attainment of proper management.

If there are extensive changes in management, new supplemental maps of overlays will be made for both the supervisor's and ranger's sets of the plans. The old maps will become a part of the records and should be filed. Field inspections will be made by members of the Regional office whenever it is deemed necessary in order to determine the actual application of the working plan on the ground.

STANDARD CLASSIFICATION OF FORAGE TYPES

In deciding upon a satisfactory system of types for classifying the range throughout the National Forests, two objects have been kept in view. These are: (1) To show by a glance at the color map as nearly as possible the general aspect of the range, and (2) to give, in addition to the general picture, as much detail as is consistent with the convenience of interpretation.

The first object is accomplished by classifying all of the lands into ten main types, each represented by a distinct color, the colors being chosen with a view to contrast and consequently to ease of interpretation. (On the field map, types will be shown by number only.) The second object is accomplished through the use of a system of subtypes. There are too many subtypes to permit the use of a color scheme or a scheme of hatching without confusion, and therefore letters are used for designating subtypes.

The general aspect of the range as it would appear to the administrator is the best guide in determining the type classification. The forage species are only occasionally conspicuous enough to contribute to the aspect of the range. If, for instance, an area supports enough aspen to make it at once apparent that this species is the most conspicuous, the area would be classified as an aspen type. There might be numerous grass or weed parks or small patches of coniferous timber less than 10 acres in extent that would be thrown into this general aspen type. An untimbered range might support sufficient sagebrush to give the landscape a general sagebrush aspect. The sage might not be the most abundant species in the type, yet because of its conspicuous habit the area supporting the sage would be classified as a sagebrush type.

Designation of Subtypes

In using letters to designate the grazing subtype, no attempt will be made to show more than the very important forage characteristics of the type. Symbols for important species, however, should be used wherever possible rather than for classes, such as "Gr-Wd-Br". The more clearly the true picture of the vegetation can be shown, the more value it will have for the administrator. If grama, for example, is the predominating species, the subtype will be indicated by its designation, that is, "G". If the vegetation is made up of several important species, in equal amounts, as, for example, pine grass, clover, and large huckleberry, with minor amounts of something else, the subtype designation would be "Pg-Cl-Lhb". If there is no predominating species or group of species, the class of vegetation will be indicated where advisable. If grasses, weeds, and browse, with no decidedly predominating species,

make up the subtype, the forage combination will be shown by the designation "Gr-Wd-Br", except that the respective designation for the class will be left out where the mixture is applied to the grass (type 1), weed (3), and browse (5) types.

No more than three combinations of letters will be used to represent grazing species in subtypes. In addition, Alpha numeric symbols in parentheses directly under the forage-type designation should be used to represent timber species. Standard letter designations will be used where possible and others adopted should be included under the legend, and these should be adhered to as much as possible on all Forests within each District to represent the species or combinations for which they stand. New designations as needed should be decided upon by the chief of party. If new designations are chosen, they should be as short as possible, preferably not more than two letters, and they should indicate as clearly as possible the names they represent. Care must be exercised that the same designation be not used for more than one plant species or group of species.

T Y P E S

Type No. 1. - Open Grassland other than meadow and secondary meadow.

Standard Color* and Crayon no.	
1	Yellow (Dixon's "Best" 353)
1Wd-Br	Yellow

This general type includes bunchgrass areas, grama grass areas, and other open grasslands, not meadow in character, where grasses predominate. Weeds or browse, or both, frequently occur in mixtures with the grasses, but the type color should be adhered to unless the area is more typically a weed or browse range. The mixture of grasses, weeds, and browse can be taken care of by the subtype, as follows:

Other subtypes in this and other types should be decided upon in accordance with instructions under "Designations of Subtype", except as specifically noted.

*Refer to "Conventional Signs, Legends and Forms for Administrative Maps" as amended.

Type No. 2. - Meadows

This general type includes meadowland where sedges, rushes, and moisture-enduring grasses are predominant, and the moist areas meadowlike in character, which occur usually as open parks in timber. The latter class are usually moist during early summer but become moderately dry by midsummer, and as consequence the predominating species are true grasses rather than sedges.

Standard color and crayon no.	
2W	Orange (Dixon's "Best" 324)

The wet meadow should be represented as:

2D	Orange.	The dry or secondary meaduw as:

Type No. 3. - Weeds

3	Brick red (Dixon's "Best" 321-1/2)	This type includes all untimbered areas where "weeds" predominate over other classes of vegetation. There is very little true weed type, as a weed cover is usually more or less temporary in character and is soon replaced by a more permanent type if the disturbing factor is removed. If there is no great predominance of the weeds over the grass or brush vegetation, and if it is possible to judge that the weed predominance is due to some unnatural factor, the weeds should be disregarded in designating the type, and the more stable vegetation should be used as an index.

Standard color and crayon no.

The weeds will then be cared for in the sub-type. For example: If a type is 40 per cent weeds, 35 per cent grasses, and 25 per cent browse, and if there is evidence of overgrazing, it should be designated "1 Wd-Gr-Br", which would indicate that weeds predominated at the time of the examination.

Type No. 4. - Sagebrush

4	Brown, (Dixon's "Best", 343.	This type includes all untimbered lands where sagebrush predominates. The sagebrush lands are usually of different range values and different in season of grazing from the areas which are listed below under browse. They are of a sufficiently distinct chara ter to justify a color designation.

Standard color and crayon no.

This and the browse type which follows are sometimes difficult to distinguish from the grass and weed types if aspect rather than the dominant class of forage is used as the distinguishing characteristic. Sagebrush may form only 15 per cent of the total vegetation of a type and still its aspect may be that of a sagebrush type. It may prove desirable, in a given region, in order to avoid complications, to decide on a certain percentage of all the vegetation in the type, say 20 per cent, as the minimum proportion of sagebrush that may be present if the region is still to be classified as a 4 type, providing, of course, it does not already have the aspect of some other type. The same will hold true of the browse type.

Type No. 5. - Browse

5 : Olive green (Dixon's "Best" 325)	This type includes all untimbered lands where browse, except sagebrush, gives the main aspect to the type or is the predominant vegetation. As in other types, subtypes under browse may be indicated by letter designations.

Type No. 6. - Range in coniferous timber supporting grasses, weeds, browse, either singly or in combination

6 : Yellow green (dark) (Dixon's "Best" 354-1/2) Standard color and crayon no.	This type includes all range in coniferous timber, except as provided under Types 7 and 9. The forage may vary from a pure stand of pine grass, or some other grass, to a pure stand of weeds or browse. It usually, however, is made up of grasses, weeds, and browse, and the proportion of each varies so widely that it is not thought advisable to attempt a division into types with distinct colors. These variations can best be represented by subtypes.

Type No. 7. - Waste areas

7 : Ultra marine blue (light) (Dixon's "Best" 330) Standard color and crayon no.	This type includes all areas of dense timber and brush which have no value for grazing or have such slight value that they cannot be economically used. This may be due either to denseness of standing or down timber or sparseness of forage growth. Large areas of very sparse forage, unless within easy reach of a better type, will be classified as a waste area because of the impracticability of running stock over so large an area to get such a small amount of feed. Just what areas of this character should be classed as waste will have to be left to the judgment of the examiner as to the actual possibility of use. This type also includes other waste areas not strictly in timber or brush and not barren which are so rough or inaccessible as to make their future use entirely improbable. Such areas are not sufficient in extent or importance to justify a separate color. The subtype designations generally encountered in this type are as follows:
7T : Ultra marine blue (light)	Waste areas in dense timber.

7D	Ultramarine blue (light)	Waste areas in down timber.
7B	"	Waste areas in brush.
7R	"	Waste areas whose rocky character prevents use.
7I	"	Permanently inaccessible areas.

Type No. 8. - Barren Land

8	Standard color and crayon no.	This type includes all areas on which there is naturally no vegetation, or practically none, including intermittent lake beds which produce no vegetation and are dry most of the year. Areas which have been denuded by overgrazing should not be confused with areas naturally barren.

Type No. 9. - Areas of woodland, supporting grasses, weeds, and browse, singly or in combination.

9	Yellow green (light) (E.Faber 6608)	This type includes all areas, except waste, in the woodland timber type. The main timber species of this type are, by districts, as follows: D-1, juniper; D-2, pinon-juniper, oak; D-3, pinon, juniper, pinon-juniper, oak, mesquite; D-4, pinon-juniper, mountain mahogany; D-5, pinon-juniper, juniper, oak, digger pine; D-6, juniper, oak and mountain mahogany. These are given as a guide in typing the range. The character of the range in this type both as regards location, carrying capacity, and management, is sufficiently distinct from the main type in coniferous timber to justify a separate type color. The forage may vary from a pure stand of grasses, weeds, or browse to a combination of any two or all. This variation can best be shown by subtype designations.

NOTE: If the information on the base map will be obscured by adding the designated colors to Types 7 and 8, it will be permissible to omit the colors and depend upon the type symbols for their proper identification.

Type No. 10 - Range in Aspen

10	Pink (light) (Dixon's "Best" 322)	This type includes all range in aspen timber, on which the aspen predominates. Subtypes for this main type will vary as in the other types according to the combination of grasses, weeds, and browse and the proportion of individual species. Subtype designations, here as in the other types, should be decided upon as suggested under "Designation of Subtypes".

Indicating Type Boundaries

The dividing line between the different types and subtypes should be shown by a dotted or broken line in black.

Condition of the Range

All areas in a badly overgrazed and depleted condition will be shown on the maps, by the horizontal hatching in the type color over the white background. When the overgrazed condition is remedied and the range improves, the color will be filled in.

These conditions are shown as follows for the weed type as a sample:

Standard Color

3	Brick red	Weed range supporting herbaceous or shrub vegetation of value for forage, and not overgrazed.
3	"	Weed range overgrazed.

District - All Regions agree in their use of this term as defined on page 39-G of the Manual.

Division - The general practice is to use "division" in its wider sense as a distinct and often separate administrative part of a National Forest. In some Regions the term is used as defined on page 39-G of the Manual.

The following is suggested as a suitable definition of "division" in its restricted sense; i.e., several allotments managed separately but logically grouped together because of some common characteristics, such as location, source of permitted stock, segregation of stock by natural or artificial barriers, etc.

Allotment - A specific part of the range to which the stock of a permittee or group of permittees is definitely assigned.

> Individual Allotment - An allotment on which a single owner's stock is permitted to graze.
>
> Community Allotment - An allotment on which the stock of a group of owners is permitted to graze.
>
> Sub-allotment (or Management Unit) - A portion of an allotment within which the movement of livestock is naturally or artificially controlled under the general plan for obtaining proper use of the allotment as a whole.

Range - All Regions use this term as a very loose expression referring to an area of any size or character occupied by livestock.

Unit - This term also is used quite loosely by most Regions to mean an area forming a complete entity in some management sense, of most any size from an area used from one camp by a band of sheep to a ranger district.

In one Region "unit" is used in the sense of an allotment. It is believed advisable not to attempt to make a specific term of it, but where it is desired to use it in a restrictive sense, to qualify the term by some such expression as "management unit", etc.

Proper Utilization - The fullest use of forage practicable, consistent with the development and maintenance of the best type of vegetation possible under conservative range management, with due consideration to all the related values involved, including timber and soil conservation.

Proper utilization should be defined for each important type under management in terms which will prescribe in a simple unit of measure, such as inches, the amount of the growth produced by each of the important plants in the type that should be left at the end of the grazing period.

Overgrazing - Over-utilization carried to the point where desirable vegetation has suffered depletion and/or where the removal of vegetation is resulting in accelerated erosion.